

Abusive Testing of Proton Exchange Membrane Hydrogen Fuel Cells

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Driven by increasingly stringent environmental regulations, the aviation community is exploring new integrated and greener technologies to satisfy aircraft power and electrical needs. Hydrogen based fuel cells are one such technology which is attractive to the aviation community due to their high power output, efficiency and environmental friendliness as compared to fossil fuels. The aviation industry has been evaluating and developing prototypes to support a variety of operations on-board. These operations range from replacing the airplane's main battery, ram air turbine or even the auxiliary power unit to supplying power to galley cooking equipment. In addition to the electrical power supply, industry is evaluating potential ways to utilize the byproducts of hydrogen based fuel cells, water and oxygen-deplete air (ODA). These byproducts could be used for fuel tank inerting, cargo bay fire suppression or water supply.

Testing in collaboration with Parker Hannifin was conducted to evaluate effects of three potential failure conditions of hydrogen PEM fuel cell stacks which were supplied by Nuvera Fuel Cells, LLC. The three conditions examined were a loss of coolant to the stack, short circuit and a crossflow condition. The presentation will provide test details and review the results of the destructive testing.